College & Career Awareness

Program Area(s): Information Technology

Lesson Plan Title: Computer Generated Imagery (CGI) Creator
Code.org The Artist Nested Repeat loops (Stages 5 & 7) Repeat loops by completing on line tutorial at code.org.

Estimated Time: 50 minutes

Primary CTE Pathway(s) Explored: Programming/Software Development

Intended Learning Outcome(s):

- Become acquainted with a wide range of occupations, CTE Pathways, career trends and emerging careers.
- Expand career awareness through participation in Work-Based Learning experiences.
- Identify career and postsecondary education options through investigation of high school to college and career pathways.
- Consider and explore nontraditional career opportunities.

College and Career Awareness Pathway Standard, Objective(s):
Standard 8, Objective 2

Cross Curriculum Integration:

- **21st Century or Interpersonal Soft Skills—critical thinking, collaboration, communication, creativity:**
- **Engineering:**
- **Math:**
- **Science:**
- **Technology:**

Career Opportunities in the CTE Pathway(s): Software developer, computer programmer, computer systems analysts computer and information systems manager, Web developer, software quality assurance, user interface designer, software entrepreneur

Nontraditional Career Opportunities: Software developer, computer programmer, computer systems analysts, computer and information systems manager, Web developer, software quality assurance, user interface designer, software entrepreneur

STEM Specific Career Opportunities: Software developer, computer programmer, computer systems analysts, computer and information systems manager, Web developer

Methods (Approach to Teaching and Learning):

- Direct Instruction and Demonstration
- Activity/Inquiry/Practice Centered Instruction

Materials Needed:

- Computer or tablet with Internet connection

Vocabulary:

- Coding – writing statements in a computer program.
- Debug – to fix mistakes in a computer program.
- Loop – to repeat a set of statements over and over.
- Repeat times – a code block that loops for a given number of times.
- Sequence – to do one statement or command one after another.

New Vocabulary:

- Nested – a loop within another loop.
- Pixel – a dot on the screen (short for picture element).
- Random – when the computer generates a value.
- Random color – when the computer generates a code to pick the color.

Prior Knowledge Required by Students:

- Basic computer skills
- Web navigation

Instructional Procedures:

Background

In this lesson students will be introduced to Code Studio and their intro course.

- Stage 5: The Artist
- Stage 7: The Artist 2

All of code.org activities are designed with the following characteristics:

- High quality.
- Self-directed, don't require any instruction.
- Designed for beginners.
- Designed as a 1 hour activity.
- Work across many OS/device platforms, including mobile and tablets.
- Work across multiple languages.
- Promote learning by all demographic groups (especially under-represented groups).

Because the activities are designed to be self-directed. A teacher does not need a lot of computer science background to get started. As students' progress through the puzzles on "Stage 5: The Artist" they are shown a video with a person who "codes" for a living and who introduces the concept or skill needed for the next 3 or 4 puzzles.

As a teacher you can setup a class for your students and have them enroll if you would like. This will allow you to monitor their progress. You can set yourself up as a teacher and then setup accounts for your students. When you do this you can print login cards for all of your students. Code.org gives prizes for teachers who have a certain number of students complete all the "stages." There are a number of "stages" which are unplugged which mean they are done without a computer. (In these lessons we will be concentrating on the puzzles that are done on the computer.)

Introduction

In this lesson students will need access to a computer with Internet access. The "Intro to Computer Science" course introduces basic computer science concepts. In "Stage 5: The Artist" and "Stage 7: The Artist 7" students use puzzles to introduce the computer science concepts of 1) sequence, 2) loops, and 3) publishing a project for others to see.

- Sequence — doing a set of commands in order, one right after another.

- Loops — repeating a set of commands over and over. Two different loop blocks are introduced. 1) Repeat—number of times, and 2) Repeat until—condition is met. We do repetitions each day: walking, climbing stairs, eating until plate is clean, etc.
- Publishing — an artist project can be done by sharing a project URL.

Coding Careers

In this lesson students are introduced to several people who are coders or have started companies coding in the videos. The "Coding Words" handout has a section for students to identify five of the coders and what career they have or the business they started.

- JR Hildebrand — a race car driver, talks about the importance of computer science to analyze how a race car is performing.
- Mark Zuckerberg — founder of Facebook talks about importance of loops.

Computer science, coding, is used in many different careers by both men and women.

Paired Programming

If you do not have enough computing devices this activity can be started with showing the puzzles on a projector and asking the students for help to solve the puzzles. Paired programming can also be used. In paired programming two students work together using the following rules:

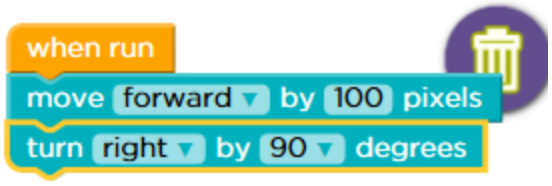
- One student drives. Uses the keyboard and mouse.
- One student gives directions.
- Students switch roles back and forth.

Videos and Puzzles:

Stage 5: The Artist

- **Puzzle 1: Video** – JR Hildebrand, a race car driver introduces the need for computer science to collect car data for analysis to help win races. He introduces two puzzle blocks to draw with. Math concepts of degrees and angles are introduced.

  move _____ by _____ pixels
  turn _____ by _____ degrees



- **Puzzle 2: Draw a square** – The set color block is introduced. Blocks are put together to draw a colored square.

- **Puzzle 3: Video** – Mark Zuckerberg the founder of Facebook reintroduces loops to make drawing simpler. A square is drawn using a repeat loop along with move and turn blocks.
- **Puzzle 4: Draw a triangle** – Draw a triangle. Color with random color is introduced.

  What angle is used on the turns to make a triangle?
- **Puzzle 5: Draw an envelope** – Two loops are used to draw a square and a triangle to create the envelope.
- **Puzzle 6: Triangle and square** – Create a triangle and a square with space in between.
- **Puzzle 7: Green glasses** are created with two squares and a line in between.

- **Puzzle 8: A star** is formed by going forward back and turning in a loop.
- **Puzzle 9: A circle** is formed with lots of small turns in a loop. How many times are needed to turn?
- **Puzzle 10: Create a design**. Students have the opportunity to draw freely to create a design. The design is "published" and can be shared with the URL that is given at the end of the project. Students can create more than one design to be shared. With the URL students can give it to friends, parents, or others. It can be viewed on a phone, tablet, or on a computer in a browser. Print the "share card" handout and cut out the cards for students to just type in the number part of the URL to share. Class projects have real value when the student can share with others besides the teacher.

  Math Question? What is the relationship between the number of repeats and the angle turned in a square, triangle, and circle?
  Answer: The number of repeats times the angle turned will equal 360.

Stage 7: The Artist 2

- **Puzzle 1: Draw a triangle** – Draw a triangle using a repeat loop.
- **Puzzle 2: Draw two triangles.**
- **Puzzle 3:-Draw a four sided pinwheel.**
  Vocabulary – nested loop –- when a loop is placed inside another loop.
- **Puzzle 4: Draw a flower** using nested loops and a triangle.
  Share drawing with share URL.
- **Puzzle 5: Draw a doily** using a repeat 36 times. Question: What angle is used?
  Share drawing with share URL.
- **Puzzle 6: Draw a small square**
- **Puzzle 7: Draw a ladder** using the small square repeated in a nested loop.
- **Puzzle 8: Draw a latticed square** repeating the ladder four times.
- **Puzzle 9: Draw a latticed ball diamond** repeating the ladder four times with a smaller angle.
- **Puzzle 10: Draw a lattice design with no sides**.
  Question: What angle is turned and how many times?
- **Puzzle 11: Nested loops free draw.** Students have the opportunity to draw freely to create a design. The design is "published" and can be shared with the URL that is given at the end of the project. Students can create more than one design to be shared. With the URL students can give it to friends, parents, or others. It can be viewed on a phone, tablet, or on a computer in a browser. Print the "share card" handout and cut out the cards for students to just type in the number part of the URL to share. Class projects have real value when the student can share with others besides the teacher.

Additional Resources:

- Scratch
- Snap

Assessment(s):

- Students can complete all the puzzles in Stage 5: The Artist and Stage 7: The Artist 2 They should also be able to share their drawing with others. The students should be able to reflect on creative careers that involve computer science.